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M summary frames selected represent video content spanning a longer period of time than mere the most recent M summary. An alternative embodiment is to also embed the summary of video of the future, i.e. about some time t, 2t, 3t, . . . after the current playback.

Another method of interleaving the selection of summary frames is shown in FIG. 14. Here, the Summary frames are listed row-wise in a triangular structure, i.e., each row has more columns than the previous one. At each step of the embedding, the frames are read off in a column fashion. For example, if each embedding step requires 4 frames, then fs1, fs2, fs4 and fs7 are first used. At the next step, fs12, fs19, fs3 and fs5 are used. This provides a non-uniform sampling in the sense that more summary frames are used that are closer to the current frame, and fewer frames are used that are further from the current frame. This achieves what is presented in FIG. 6B.

In an interactive video playback environment, such as the desktop or video streaming, the summary frames displayed with the playback frames can be further used for hyperlinking purposes, i.e., a user could click (or select) frames f_{si} and the playback will continue from frame f_{si}.

A preferred use of summary-hyperlinking is now described. At the playback of some current shot s_i, the summary frames of the past shots and future 1 shots are simultaneously shown. The user can then easily see and replay one of the recent 1 shots or skip to one of the next shots; this is in contrast to the current method of video playback, in which a user can only see the current frame being playback.

Another preferred use of summary-hyperlinking is to embed the summary frames not of the current video being played back, but to embed the summary of video of another program. A user can then click (or choose) to jump to that particular. An example use would be showing the summary of another football game while the video playback is of another. A user can then watch the current game but also grasp the summary of the other game. He can also switch to the other game directly without the needing to know the channel.

For digital video compressed with standards such as MPEG-1 and MPEG-2, a preferred method to embed the summary frames is at the user-data area, which are specified by a particular header. To further ensure that the summary frames from the bitstreams can be extracted and displayed from any point (i.e., not necessarily from the very beginning) in the bitstreams, a new set of summary frame is embedded at fixed intervals T. For an MPEG-1 video (352 by 240 pixels) at 1.5 Mbits/sec, a DC image takes up 1.8 Kbytes. If in one sec, 4 DC images are embedded, then the overhead is 7.2/192 or 3.75%. If instead, 1 DC image is embedded in each second, the overhead is 0.09375 %. For an MPEG-2 video (704 by 480 pixels) at 4.0 Mbits/sec, a DC image takes up 7.92 Kbytes. The overhead for embedding 4 DC images/sec is 6.1% and for 1 DC image/sec is 1.5%. For higher bit rate MPEG-2 such as 6.0 M bits/sec, the respective overhead becomes 4% and 0.38%. The embedding process operates directly on the compressed video and does not require any decompression, and thus very computationally efficient.

While the invention has been described in terms of preferred embodiments, those skilled in the art will recog-nize that the invention can be practiced with modification within the spirit and scope of the appended claims.

What is claimed is:

1. A video viewing system, comprising:

a display screen for viewing a video program in progress; and

at least one summary frame superimposed on said display screen along with said video program in progress, said at least one summary frame comprising a past frame from said video program in progress,

wherein selecting said at least one summary frame hyperlinks the video program in progress to begin playing from said selected summary frame.

2. A video viewing system comprising;

a display screen for viewing a video program in progress;

at least one summary frame superimposed on said display screen along with said video program in progress, said at least one summary frame comprising a past frame from said video program in progress; and

at least one preview frame comprising a future frame from said video program in process,

wherein selecting one of said summary fame and said preview frame hyperlinks the video program in progress to begin playing from said selected one of said summary frame and said preview frame.

3. A user interactive video viewing system comprising;

a display screen for viewing a video program;

at least one summary frame superimposed on said display screen said at least one summary fame comprising one of a past or future frame from said program; and

a control means for allowing a user to change said video program and for allowing said user to select said at least one summary frame to play at least a segment of said video program corresponding to said selected summary frame,

wherein said viewing system comprises client connected to a server, and

wherein selecting said at least one said summary frame hyperlinks said server to start playing said video from said summary frame.

4. A method for informing a viewer of the content of a video program in progress, comprising the steps of:

selecting a plurality of summary frames depicting selected events from a video program;

embedding said summary frames in said video program;

transmitting said video program comprising said summary frames over a media;

displaying said video program comprising said summary frames on a screen;

hyperlinking to a corresponding portion in said video program when a particular summary frame is selected by a viewer; and

playing said video program from said corresponding portion in said video program.

5. A method for informing a viewer of the content of a video program in progress, comprising the steps of:

selecting a plurality of summary frames depicting selected events from a video program;

embedding said summary frames in said video program;

transmitting said video program comprising said summary frames over a media; and

displaying said video program comprising said summary frames on a screen, 5

wherein said selecting step comprises the steps of;

scanning a first frame of said video and designating said first frame as a key frame;

scanning next frame in said video;

comparing said next frame to said keyframe with a difference function, 10

if a result of said difference function is negative scanning another frame in said video,

if said result of said difference function is true, then designating said next frame as said key frame;

comparing said key frame with summary frames currently being displayed to find one with a smallest difference; and

replacing said one with a smallest difference with said key frame.

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